ECE204 AC Circuits

Midterm Exam 2
10/19/2010

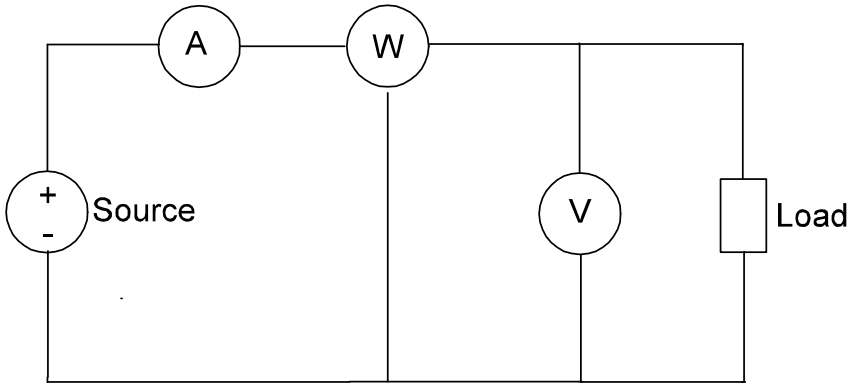
NAME: KEY

- **NO PARTIAL CREDIT WILL BE GIVEN** without a full explanation of the procedure followed to arrive at your solution. Put a box around your solution. **DON'T FORGET UNITS AND CONDITIONS ON VALIDITY.**
- One 8 ½ x11 inch formula sheets (both sides) may be used. Laptops may not be used. Cellphones must be turned-off.
- Time allowed : 50 min.
- You may use both sides of the paper for your answer. Please use the back of the previous page.
- Present all ***phasor*** quantities in ***polar*** form with the angle in degrees and state magnitudes to 3 significant figures.

Question #	Possible Points	Awarded Points
1	25	
2	25	
3	25	
4	25	
Total	100	

1. In the circuit shown below the voltmeter reads 300 V, the ammeter reads 25 A, and the wattmeter reads 6 kW. The load is a resistor and capacitor in ***parallel***. Determine:

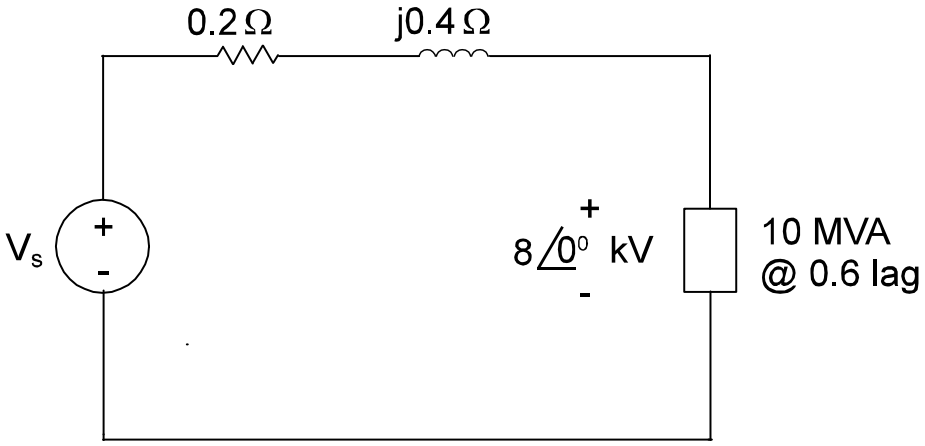
a) Real Power
b) Apparent Power
c) Reactive Power
d) Power Factor
e) Load Components (R & C) if the frequency is 1 kHz



6 kW 7.5 kVA -4.5kVAR 0.8 lead

2. The following figure shows a distribution feeder whose impedance is 0.2 + j0.4 Ω that supplies a load of 10 MVA, 0.6 lagging pf, at 8 kV. Determine:

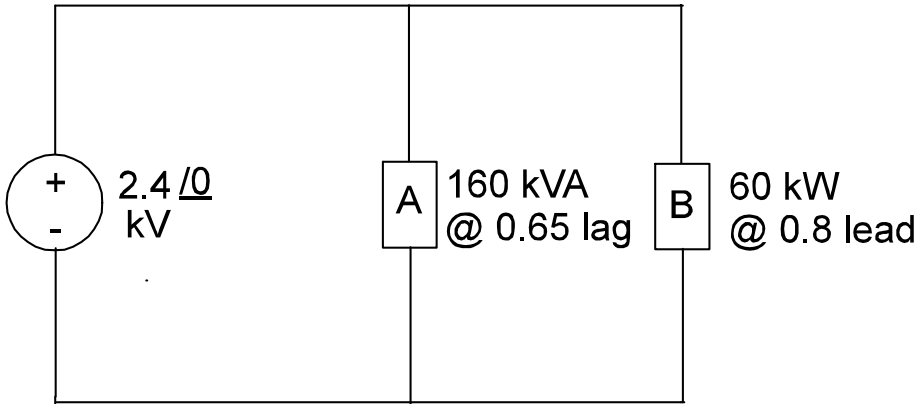
a) Magnitude of the supply voltage (V_S)
b) Percent Voltage Regulation (VR)
c) Real power lost in the feeder



8.551 kV . 6.88% . 312.5 kW .

3. Two loads A & B are supplied at 2.4 kV, 60 Hz, from an ideal source, as shown below. Load A is 160 kVA at 0.65 lag, and load B is 60 kW at 0.8 lead. Determine:

a) The complex power drawn from the source
b) The additional reactive power needed to make the overall pf 0.95 lag
c) The value of capacitive reactance that will produce the reactive power in part (b)
d) The value of capacitance (μF) that has to be placed in parallel with the load to achieve the results of (b) and (c)



$181\angle 25^0$ kVA . 22.69 kVAR 253.9 Ω . $C = \frac{1}{377 \text{ x } 253.9} = 10.45\ \mu F$

4. A 12.8 kV three-phase supply feeds a balanced delta-connected load consisting of $\boldsymbol{Z} = 46\angle 30^0\ \Omega$/ph. Determine:

a) the line and phase voltages and currents, and
b) the real, reactive and apparent power supplied to the loads
c) the power factor of the load.

$$\mathbf{V_{ab}} = 12.8\angle 0^0 \qquad \mathbf{V_{bc}} = 12.8\angle 240^0 \quad \mathbf{V_{ca}} = 12.8\angle 120^0$$

$$\boldsymbol{I_{ab}} = 278.3\angle -30^0\ \text{A}, \quad \boldsymbol{I_{bc}} = 278.3\angle 210^0\ \text{A}, \quad \boldsymbol{I_{ca}} = 278.3\angle 90^0\ \text{A}.$$

$$\boldsymbol{I_a} = \text{I}_a = 482\angle -60^0\ \text{A}, \qquad \boldsymbol{I_b} = 482\angle 180^0\ \text{A}, \qquad \boldsymbol{I_c} = \text{I}482\angle 60^0\ \text{A}.$$

9.254 MW 5.343 MVAR 10.69 MVA 0.866 lag .